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THE ETIOLOGIC AGENT AND THE LOCALIZING FACTOR OF THE ABSCESES IN MYOSITIS PURULENTA TROPICA *

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Myositis purulenta tropica is a disease characterized by the development of deep muscle abscesses in the limbs or trunk, associated with rheumatoid pains and tenderness in the affected muscles and an irregular febrile temperature. The parts most often affected are the great muscles of the extremities, especially of the thigh and calf, and the muscles of the trunk, abdomen and chest. The muscles of the face, neck and hands are said to be exempt. There is a great tendency to multiple abscesses, several developing simultaneously or successive crops of them appearing at intervals. Owing to the deep location of the abscess in the muscle there is little or no superficial evidence of the inflammation, such as redness, heat and swelling; but by palpating deeply one can feel an induration with ill defined boundaries. Occasionally when the abscess is allowed to come to maturity a slight swelling of the surface is evident. The treatment is surgical; when opened and properly drained the abscess usually heals rapidly and completely. Unless acquainted with the disease one is liable not to find the pus pocket at operation from failure to go deep enough; as it frequently lies close to the bone. The quantity of pus is often large and may, on account of the pressure to which it is subjected in the depth of the great muscles, escape forcibly when the abscess is incised. Microscopically and culturally the pus usually shows pyogenic cocci, sometimes staphylococci, sometimes streptococci and sometimes both staphylococci and streptococci; occasionally the pus has been found sterile. Without surgical interference the abscess may work its way to the surface, or it may remain cryptic causing obscure symptoms and running a lingering course; in either case it is prejudicial to the general health, the patient becoming emaciated, falling into a decline and sometimes dying from a generalized infection.

The geographic distribution of myositis purulenta tropica is somewhat uncertain on account of other pathologic conditions apparently

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having been confused with it. The disease was first described by Ziemann¹ in West Tropical Africa. It has also been reported in Kaiser Wilhelm's Land,² South Sea Islands,³ Panama Canal Zone,⁴ and British Guiana.⁵ The so-called mumu fever of Samoa has been considered identical with myositis purulenta tropica; but the symptomatology of the former disease, as described by Leber and Prowazek,⁶ is that of an erysipelas-like edema of the skin and subcutaneous tissues. Of uncertain relationship also are the filarial abscesses described by Maxwell⁷ in China. These abscesses occur in the scrotum, the intra-abdominal and intrathoracic regions, and in the limbs; but in the last location they are always in regions rich in lymphatic tissue and generally in the immediate neighborhood of the large vessels.

In the upper Madeira valley, Brazil, myositis purulenta tropica is of semi-frequent occurrence. During my stay of five months at Porto Velho 4 cases entered the hospital of the Madeiro Marmaré railway company. Of these cases one had 2 muscle abscesses, and two had suffered previous attacks of myositis. The location of the abscess was in the muscles of the thigh in two, of the calf in one, of the subcostal region in one, and of the chest in one case. The amount of pus removed from the abscesses at operation varied from 25 to 500 c.c. There was no history or clinical evidence of filarial infection in any of these cases. Microscopically the pus consisted of polymorpho-nuclear neutrophile leukocytes with no excess of eosinophiles. Microscopically and culturally *Staphylococcus aureus* was found in 3 and *Staphylococcus albus* in 1 of the cases. Thick blood smears made at night, and from two of the patients in the daytime, were negative for filarial larvae. Differential leukocyte counts of the blood of two of the patients did not show an eosinophilia.

The etiology of myositis purulenta tropica is generally considered to be filarial (Kulz,⁸ Ziemann,⁹ Wise and Minett⁵). Rodenwaldt¹⁰ alone considers it a special form of pyemia. According to the conception of the filarial theory the adult female worm by her death or

¹ Mediz. Berichte aus den deutschen Schutzgebieten, 1904-5, 138.

² Ibid., 173.

³ Arch. f. Schiffs- u. Trop.-Hyg., 1912, 16, Supp. 4.

⁴ Personal communication.

⁵ Report of the Advisory Committee for the Tropical Disease Research Fund for the years 1912-13, pp. 108-114.

⁶ Arch. f. Schiffs- u. Trop.-Hyg., 1911, 15, pp. 409-430.

⁷ Brit. Med. Jour., 1901, 2, p. 609.

⁸ Arch. f. Schiffs- u. Trop.-Hyg., 1912, 16, p. 313.

⁹ Ibid., 1913, 17, p. 469.

¹⁰ Ibid., 1914, 18, p. 41.

through the deposition of ova, or perhaps also by the production of toxins in the lymphatics, incite the tissue reactions that result in the development of the abscess. The pyogenic cocci frequently found in the pus are considered to be secondary invaders. Kulz⁸ goes farther and ascribes the etiology of this disease to a certain species of filaria, *Loa* (*Filaria*) *loa*. Ziemann⁹ also considers *Loa loa* to be of especial etiologic importance in myositis, but thinks that *Filaria bancrofti* may also be considered in its production.

In considering the etiology of myositis purulenta tropica one must distinguish between the etiologic agent which incites the pus formation and the localizing factor which determines the peculiar situation of the abscesses in the muscles. These two factors, although hitherto confused, are quite distinct. As an illustration of this distinction, osteomyelitis, and endocarditis may both be caused by infections with *Staphylococcus aureus*, but the localizing factor which determines the situation of the infection and consequent lesions in the two diseases is evidently quite distinct from casual agent. The etiologic agent of myositis purulenta tropica is evidently not filariae but the pyogenic cocci, because:

1. The pyogenic cocci, as all authors agree, are usually found in the pus, and they are probably always present in the early stages of the abscess. The occasional absence of these organisms reported by Kulz,⁸ Ziemann,⁹ and Wise and Minett⁵ are probably due to the age of the abscess. It is well known that the pyogenic cocci frequently disappear in the later stages of suppurative processes.

2. The pyogenic cocci found in these deep muscle abscesses cannot be secondary invaders in the ordinary sense because they can reach these locations only through the blood stream.

3. The cellular reaction in these muscle abscesses is not characteristic of filarial infections. The cellular reactions to living filariae are fibrous tissue and eosinophiles (Bahr¹¹), and to dead filaria calcification (Wise,¹² Bahr¹¹); while the cellular reaction in myositis purulenta tropica is polymorphonuclear neutrophiles, which is the characteristic reaction to the pyogenic cocci.

4. From the prevalence of filarial infections in certain regions and the frequency with which dead and calcified filariae are found in the tissues at autopsy, it is evident that filariae of themselves are incapable

¹¹ Jour. London School of Trop. Med., Supp. 1, 1912.

¹² Jour. Trop. Med. and Hyg., 1910, 13, p. 137.

of producing abscesses. On the other hand, the pyogenic cocci are capable of producing, and if localized in the muscles must inevitably produce, the total clinical and pathologic picture of myositis purulenta tropica.

It is generally recognized that a pyemia always depends on an antecedent septicemia, which may be of only temporary character. It is probable that in the majority of pyemias the invasion of the blood is indirect as a result of the involvement of the vessels in the primary inflammatory focus and the consequent formation of thrombi. From these infected thrombi small particles containing bacteria pass into the general circulation and reach capillaries too small to allow their passage, or because of pressure on or injury to the capillaries become fixed in certain locations where they multiply. The primary lesion, which serves as a portal of entry of the bacteria, may sometimes be evident but is often obscure, as in slight skin lesions which may be overlooked or healed before the pyemia develops. Roenwald¹⁰ believes that in myositis purulenta tropica in Togo the portal of entry of the pyogenic cocci is through the lesions produced by sand fleas or jiggers (*Dermatophilus penetrans*) which are very prevalent in that region.

It is not, however, the portal of entry of the pyogenic cocci — for which there is abundant opportunity in native peoples of tropical countries — but the localizing factor which makes myositis purulenta tropica a pyemia sui generis. Pyemias occur everywhere, but localization in the deep muscles is limited to the tropics and apparently to certain regions of the tropics; consequently it would seem that there must be some localizing factor peculiar to these regions. It is in this connection that the filariae may come into consideration. *Loa loa*, notwithstanding the arguments of Kulz,⁸ can be excluded both by its geographic distribution and by the habitat of the adult worm in the subcutaneous connective tissue. *Filaria bancrofti* is more open to suspicion as a localizing factor. Wise and Minett⁵ have supplied the best evidence incriminating this worm. These authors made a careful search of the contents of 28 deep seated abscesses in British Guiana and found adult *Filaria bancrofti* or pieces of them in 22 of the cases. It is difficult, however, to understand why myositis purulenta tropica is apparently absent in many countries, such as Arabia, India, Indo-China, the Philippine Islands, and Australia, where infections with *Filaria bancrofti* are common. In the Madeira valley, according to the records of the Candelaria Hospital, clinical evidence of filariasis is rarely if ever met with. While time did not permit an extended

search for such infections by blood examinations, a considerable number of thin and thick blood smears were examined for malarial parasites without encountering filarial larvae. None of my cases of myositis purulenta tropica showed any clinical evidence of filariasis. The adult *Filaria bancrofti* lives in the lymphatics and might by the obstruction of the lymphatic vessels cause pressure or injury to the neighboring capillaries and thus cause a localization of the pyemic foci. If this be true one might expect that the localization would occur most frequently, as do the other manifestations of filariasis, in the regions of the body richest in lymphatics instead of the deep muscles where the lymphatic vessels are fewer in number and smaller. It may be, however, that the smallness of the lymphatic vessels in the deep muscles is an important factor in the process. Such small lymphatic vessels might be more liable to become obstructed by the adult filariae, and cause pressure or injury to the adjacent blood capillaries, than the larger lymphatic vessels of the subcutaneous tissues.

From the foregoing it may be concluded that myositis purulenta tropica is a peculiar form of pyemia. The causal agent in its production is most certainly the pyogenic cocci usually found, and probably always present at some time, in the abscesses. The localizing factor which determines the peculiar situation of the pyemic foci is probably filarial, but the evidence on this point is not conclusive.